Application No. 10/008,853
Filed: 11/16/01
Group Art Unit: 2827

REMARKS

1. This is in response to the Office Action mailed 10/2/02. Claims 1-13 remain pending in this application.

2. Applicant has amended the title to be consistent with the version in the Declaration and Assignment.

3. Applicant requests reconsideration of the rejection under 35 USC 112, second paragraph. Applicant has amended claim 11 by eliminating the word "the" in line 6.

4. Applicant requests reconsideration of the rejections under 35 USC 103.

a. One significant difference between the instant invention and the prior art cited relates to the use of a tacky thermosettable flux. This type of flux used in the instant application provides several benefits, namely (1) pushing away the filled underfill around the pads and bumps (page 2, lines 2-4), (2) providing solder wetting (page 8, lines 8-11), and (3) providing a fully thermosettable polymer compatible with the underfill (page 6, lines 4-6). It should be emphasized that the flux in the instant application is unfilled (see claim 1, step b).

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

These attributes of the instant invention provide an unexpected benefit vs. the prior art. As indicated on page 3, line 16ff, and page 5, line 27ff of the application, the prior art, due to the presence of fill in the underfill, results in a high solder defect rate. (See analysis of the quality of the solder joints in the instant application on page 9, line 2ff.) In addition, the method of the instant invention is conducive to high volume production.

Furthermore, when unfilled underfill was used in the prior art, the underfill was frequently incompatible with the flux, resulting in poor quality solder joints. In addition, the addition of fill is preferred, in order to reduce the mismatch between components due to differences in coefficient of thermal expansion.

The type of flux used in Capote is quite different from that in the instant application, since the flux in Capote (material added to the chip - see **37** in his Fig. 13) is filled, preferably highly filled (see col 9, line 24ff in Capote). Please clarify where Capote discloses that the adhesive flux optionally contains filler. (See comment in 10/2/02 Office Action on page 2, lines 3-4 from bottom of page.) It is recognized that the second portion of the underfill can contain little or no filler. (See Capote, col. 9, lines 31-32, where he refers to the encapsulant material

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

on the substrate - item **39** in his Fig. 13.) Even if the flux optionally contains filler, there is no suggestion that the flux is "tacky" or provides the benefits of the flux used in the instant application.

Wang differs from Capote in that, in Wang, the substrate is heated, and no flux is applied to the chip.

Neither Gilleo nor Kirsten involve the use of a tacky thermosettable flux.

b. Applicant believes that claim 1, relating to a method for underfilling an electronic chip mounted on a substrate, and claim 11, relating to a process for connecting an integrated circuit chip to a substrate, should be patentable over the prior art cited (Capote combined with Gilleo; Wang combined with Kirsten; Wang combined with Kirsten and Gilleo) because of the above discussion. All of the other claims are directly or indirectly dependent on either claim 1 or claim 11, and, since these dependent claims introduce further limitations, they also should be allowable.

c. Furthermore, regarding claims 6-8, the viscocity of the flux plays an important role in the success of the method, since it displaces any filler in the underfill and provides for a high quality soldered joint in which the filler does not interfere. (See page 6, line 28ff)

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

lication No. 10/008,853
Filed: 11/16/01
Group Art Unit: 2827

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

WUSHENG YIN ET AL

By: _____
Arthur S. Morgenstern
Registration No. 28,244
Attorney for Applicant(s)

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
Ten Post Office Square
Boston, MA 02109
Telephone: (617) 542-2290
Telecopier: (617) 451-0313

ASM/lkw/282745v2

Application No. 10/008,853
Filed: 11/16/01
Group Art Unit: 2827

MARKED-UP VERSION OF SPECIFICATION AND CLAIM AMENDMENTS

Title:

[NEW] METHOD OF APPLYING FILLED NO-FLOW UNDERFILL

Claims:

11. A process for connecting an integrated circuit chip to a substrate comprising

a. coating the connection area of said substrate with an underfill,

b. dipping said chip into a tacky thermosettable flux so that [the] connection bumps of said chip are coated with said flux,

c. placing said chip having said flux onto said substrate so that the bumps of said chip are in contact with the pads of said substrate,

d. soldering said chip to said substrate, and

e. curing said underfill.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313